(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4032 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. I) EVEN THEORY EXAMINATION 2012–13

MECHANICAL ENGINEERING

TME201

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4039 Roll No. | | | | | | | | | | |

((SEM. II) EVEN THEORY EXAMINATION 2012–13

MECHANICAL ENGINEERING

Time : 3 Hours *Total Marks : 100*

Note :– (i) Answer all the questions. Each question has its own options.

(ii) Marks are shown at the right side of the questions.

(iii) Use of non-programmable calculator is allowed.

(iv) Use of Steam Table and Mollier Chart is permitted.

(v) Any data required may be assumed suitably.

(vi) Draw neat sketches wherever necessary.

1. Attempt any **four** parts of the following : **(4×5=20)**

(a) Differentiate between microscopic and macroscopic points of view in thermodynamics.

(b) How do the following properties differ :

(i) Extensive

(ii) Intensive.

(c) What do you mean by "Perpetual Motion Machine of first kind-PPM 1" ?

(d) Find the coefficient of performance and heat transfer rate in the condenser of a refrigerator in kJ/h which has a refrigeration capacity of 12000 kJ/h when power input is 0.75 kW.

(e) What is entropy ? Also describe its characteristics.

(f) Explain the concept of continuum with suitable examples.

2. Attempt any two parts of the following : (2×10=20)

(a) Explain the following terms relating to steam function :

(i) Dryness fraction of steam

(ii) Superheated steam

(iii) Enthalpy of wet steam

(iv) Latent heat of steam.

(b) With the help of neat sketches explain the working of a four stroke SI engine.

(c) An engine working on diesel cycle has air intake condition of 1 bar and 310°k and compression ratio is 17. Heat added at pressure is 1250 kJ/kg. Make calculations for the maximum temperature of the cycle, net power output and thermal efficiency of the cycle.

3. Attempt any two parts of the following : (2×10=20)

(a) Define the following :

(i) Lami's Theorem

(ii) Angle of repose

(iii) Equations of equilibrium

(iv) Concept of Free Body Diagram.

(b) Determine the resultant of the forces acting tangential to the circle of radius 3m as shown in fig. 3(b). What will be the location w.r.t. the centre of the circle ?

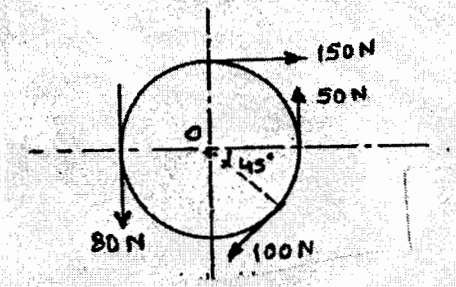

Figure 3(b)

(c) Derive the relation $\frac{T_2}{T_1} = e^{\mu\theta}$ for the tensions on the tight and slack sides of the belt passing over a pulley with friction.

4. Attempt any two parts of the following : (2×10=20)

(a) (i) Derive the relationship between shear force, bending moment and loading for a beam.

(ii) Define and differentiate between a perfect, deficient and redundant truss.

(b) Determine the magnitude and nature of forces with all the members of the truss shown in fig. 4(b).

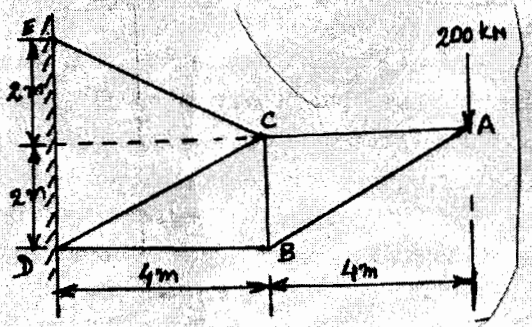

Figure 4(b)

(c) Draw SFD and BMD for the loaded beam shown in the fig. 4(c).

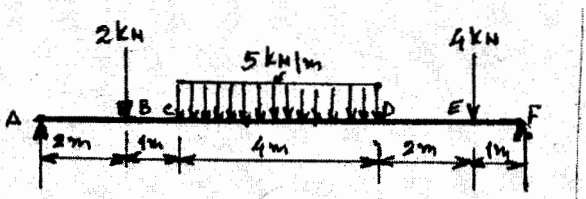

Figure 4(c)

5. Attempt any **four** parts of the following : **(4×5=20)**

(a) Draw stress-strain curve for ductile material specifying each point on the curve.

(b) Derive the Bending Equation $M/I = \sigma/y = E/R$, also enumerate the assumptions made.

(c) A metallic rectangular rod 1.5 m long, 40 mm wide and 25 mm thick is subjected to an axial tensile load of 120 kN. The elongation of the rod is measured as 0.9 mm. Calculate the stress, strain and modulus of elasticity.

(d) A rectangular beam with depth 150 mm and width 100 mm is subjected to a maximum bending moment of 300 kNm. Calculate the maximum stress in the beam.

(e) Derive the Torsion equation $T/J = \tau/r = G\theta/L$ stating the assumptions made.

(f) 20 kN-m torque is applied to a shaft of 7 cm diameter. Calculate the maximum shear stress in the shaft. What will be the shear stress at the central axis of the shaft ?